Perceiving the Rewarded Reality: How Incentives Influence Perception of Objects in Reward-Based Voluntary Task Switching

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Introduction

The Relationship Between Attention and Reward

Reward influences attention:
- Changes in reward might automatically capture attention.

Active attentional template influences search for reward information:
- Attention might be drawn to reward feedback that is consistent with internal goals.

How is attention recruited to assess reward?

Attention, Rewards, and Decisions
- People are motivated to maximize reward and minimize effort.
- If the goal is to choose a task that will yield the most reward for the least amount of effort, how will people mobilize attention to accomplish this goal?

Approach:
- We drew from the voluntary task switching paradigm, where the choice to repeat tasks is less effortful than the choice to switch.
- We assigned rewards to tasks to investigate (a) the relationship between reward information and attention, and (b) the interaction between reward information and attention on task selections.

How do changes in reward influence selection as a function of fixations?

Method

Reward-Based VTS

Systematically assign values to tasks
- Points (1-10) linked to each task
- Reach 500 points as fast as possible

Eye Tracking Apparatus
- Tobii 60 Hz biocular recording
- Regions of interest around rewards and target stimulus
- Participant seated 60 cm from screen with chinrest

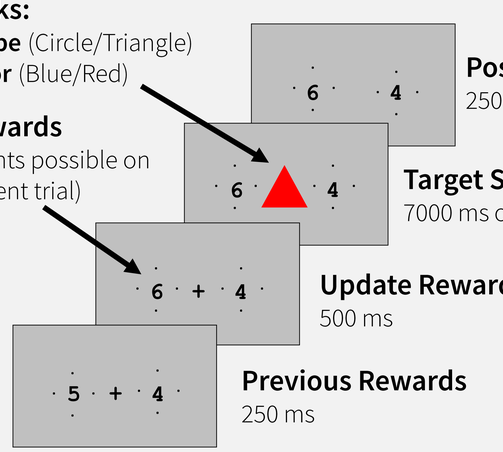
Independent Variables

Previous Task
constant – remain constant
decrease– decrease by one

Other Task
constant – remain constant
increase – increase by one

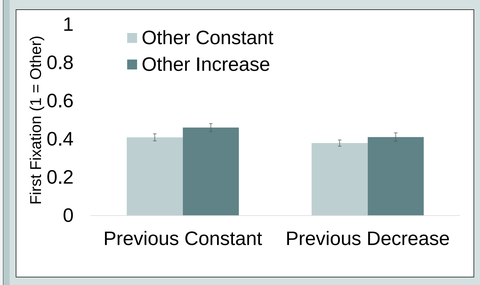
Tasks:
Shape (Circle/Triangle)
Color (Blue/Red)

Rewards
(Points possible on current trial)



Results

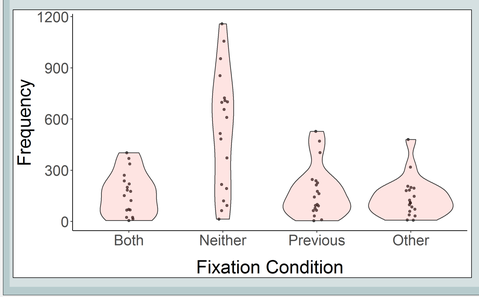
Characteristics of Fixations



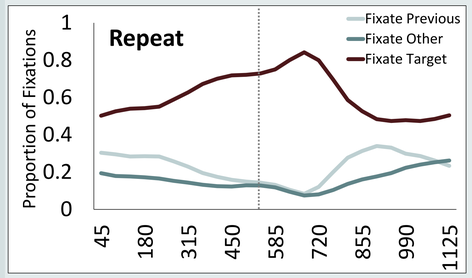
Does Changing Reward Influence First Fixation?

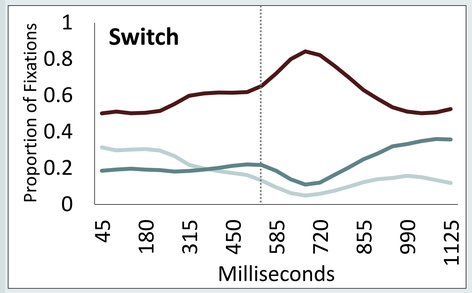
When only one reward changes, slight bias to attend that reward; but:

Overall bias to fixate previous task's reward first.



Individual Variability in Fixation Tendency
- Overt fixation to reward is highly variable.
- Most subjects fixate reward, but not on every trial.





Fixation Patterns Across a Trial

On Repetition Trials:
- Begin fixating previous task's reward
- Quickly fixate back to target

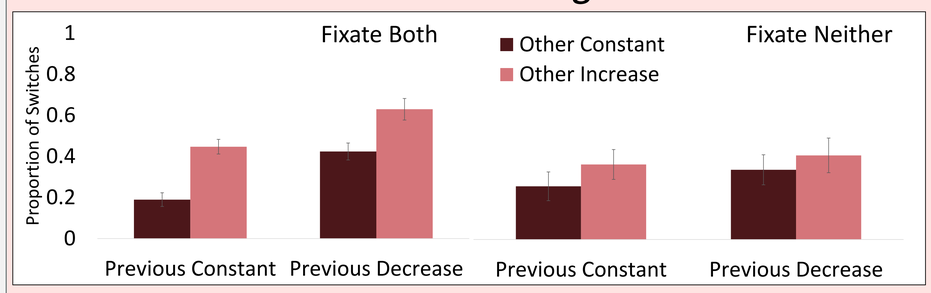
On Switch Trials:
- Begin fixating previous task's reward
- Change over and fixate other task's reward
- Delayed fixation back to target

In General:
- Task selections highly associated with fixations to reward

First Fixation	Mean Switch Rate
Previous Reward	30%
Other Reward	53%

p < .001

Reward Influences Selection Through Fixations



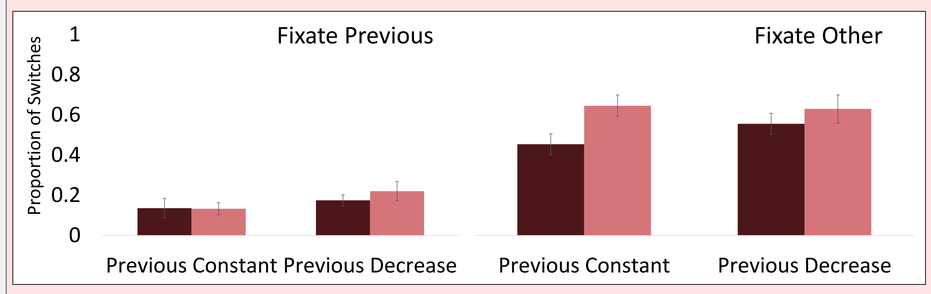
All or Nothing

Task selections only significantly influenced by changing reward after fixating both rewards.

Fixating reward increases the strength of reward's effect on selection.

	Previous	Other
Fixate Both	.28*	.36*
Fixate Neither	.06	.10

Why are effects in the same direction in both conditions?
- Covert attention detecting change in reward
- Updating reward from memory



One or the Other

Effect of reward on choice depends on which reward was fixated.

Fixating only previous or other task reward leads to a bias to select that task.
- Almost regardless of how that reward has changed

	Previous	Other
Fixate Previous	.10	.004
Fixate Other	.02	.13

Conclusion

Attention is drawn to the reward associated with the active attentional template.
- Although there were large individual differences in fixations to task values.
- There was some evidence to suggest that changing rewards influences fixations.

When reward information is fixated, it highly influences task selections.
- Might suggest a reliance on working memory throughout the task

Reward-Based Voluntary Task Switching
- Reveals the underlying interactions of motivation, effort and attention on decision making

Fixations ⟷ Selections

The relationship between fixations and selections:
- Does fixating rewards drive task selections?
- Or do task selections drive fixations to task rewards?